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(54) Title of the Invention Touch Input Detection Method and Touch Input Detector

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(54) [Title of the Invention]

(57) [Abstract]
[Topic] This invention improves operability with touch detection sensors that diversify the input means and makes it multi-functional. A thin electronic mechanism for a touch input detecting device.

[Solution] To control the continuously input events with a touch detection means comprised of touch detection sensors with either a uniform or non-uniform arrangement continuously along a specific line, plane curve or arc; a means to capture the repeated touch input length, time and direction along the trajectory; a means to calculate the speed from the length, time and direction; and a means to calculate the acceleration from the speed so that at the exact moment the dial is turned, the so-called wheel also turns. By installing this means on a touch input detector, a thin input device can be obtained.

[Claims]
[Claim 1] A touch input detection method comprised of an input device that has a touch detection means equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; a means to capture physical phenomena generated via touch and a means to continuously add or subtract the physical quantity by replacing the physical phenomena repeatedly input by touch with scalar quantity information and vector quantity information.
[Claim 2] A touch input detection method comprised of an input device that has a touch detection means equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; and a means to capture the distance and direction of the input repeated by touch along a trajectory.
[Claim 3] A touch input detection method comprised of an input device that has a touch detection means equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; a means to capture the length, time and direction input repeatedly by touch along a trajectory and a means to calculate the speed from the distance and time.
[Claim 4] A touch input detection method comprised of an input device that has a touch detection means equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; a means to capture the distance, time and direction input repeatedly by touch along a trajectory and a means to calculate the speed from the distance, time and direction.
[Claim 5] A touch input detection method comprised of an input device that has a touch detection means equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; a means to capture the distance, time and direction input repeatedly by touch along a trajectory; a means to calculate the speed from the distance, time and direction and a means to calculate the acceleration from the speed.
[Claim 6] A touch input detection method as claimed in Claims 1-5 comprised of an integrated input device that has multiple touch detection means with either a parallel or simplified parallel arrangement that are equipped with touch detection sensors arranged continuously along a specific line, plane curve or arc; and that can use the aforementioned means to capture and calculate relevant detection information.
[Claim 7] A touch input detection method as claimed in Claims 1-6 comprised of an input device that has a touch detection means equipped with keys on touch detection sensors arranged continuously along a specific line, plane curve or arc, and that can use the

aforementioned means to capture and calculate relevant detection information.

[Claim 8] A touch input detection method as claimed in Claims 1-7 where instead of the aforementioned touch input detection, information generated between the contact state and the non-contact state applies to the aforementioned means.

[Claim 9] A touch input detection method as claimed in Claims 1-7 where in addition to the information generated from the aforementioned touch input, the information generated between the contact state and the non-contact state applies to the aforementioned means.

[Claim 10] A touch input detection method as claimed in Claims 2-9 where instead of the aforementioned distance information input, the number of events generated via sensor detection is employed and the number of events for each unit of time is substituted for the speed, velocity and acceleration.

[Claim 11] A touch input detection method as claimed in Claims 1-10 where the aforementioned touch detection means has touch detection sensors along a specific trajectory at varying densities, and that can use the aforementioned means to calculate relevant detection information.

[Claim 12] A touch input detection method as claimed in Claims 1-10 where the aforementioned touch detection means has symmetrically distributed touch detection sensors along a specific trajectory; that has touch input event generation positions or generation intervals that are set at varying densities and that can use the aforementioned means to calculate relevant detection information.

[Claim 13] A touch input detection method as claimed in Claims 1-10 where the aforementioned touch detection means has symmetrically distributed touch detection sensors along a specific trajectory, and can simultaneously use the aforementioned means to capture and calculate relevant detection information as well as alter the touch input event generation positions or generation intervals that are set at varying densities according to the speed, velocity and acceleration.

[Claim 14] A touch input detection method as claimed in Claims 1-13 comprised of an input device with a finger touch detection means continuously along a specific trajectory that has a detection means for one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and that can apply the aforementioned for detection of input information as one-dimensional coordinate position information.

[Claim 15] A touch input detection method as claimed in Claims 1-14 comprised of an input device with a finger touch detection means continuously along a specific trajectory and a control means containing an arithmetic processor and an electronic mechanism that has a data pointer for a specific data table on the software, where

the results of the calculations conducted on this means are synchronized with the data pointer and that can be shifted or fast-forwarded.

[Claim 16] A touch input detection method as claimed in Claims 1-15 comprised of an electronic mechanism with a display means and a cursor to display which of multiple items are currently selected, and a finger touch detection means continuously along a specific trajectory, where the results of the calculations conducted on this means are synchronized with the cursor and that can be shifted or fast-forwarded and displayed.

[Claim 17] A touch input detection method as claimed in Claims 1-16

comprised of the aforementioned input device equipped with an audio generation function and a means to generate audio synchronized with the capture, calculation and input of relevant detection information by the aforementioned means.
[Claim 18] A touch input detection method as claimed in Claims 1-17 comprised of the aforementioned input device equipped with a luminophor and a means to generate light using the luminophor synchronized with the capture, calculation and input of relevant detection information by the aforementioned means.
[Claim 19] A touch input detection method as claimed in Claims 1-18 comprised of a means to capture and calculate touch input by finger movement or touch as well as an event detection means that differs from the input means by continuous multiple touch in the same position.
[Claim 20] A touch input detection method as claimed in Claims 1-18 comprised of an input device equipped with at least one switching means to turn the point of contact on and off, and an event input means that captures and calculates the relevant detection information by the aforementioned means using the switching means.
[Claim 21] A touch input detection method as claimed in Claim 20 with a means to capture event input from the switching means if the switching means is constructed of touch sensors.
[Claim 22] A touch input detection method as claimed in Claims 1-20 comprised of an integrated input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory and a switching means to turn the point of contact on and off, and a means to capture and calculate the relevant detection information by the aforementioned means.
[Claim 23] A touch input detection method as claimed in Claims 1-21 comprised of an input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory and a switching means adjacent to the touch detection sensors that turns the contact point on and off, and that receives the event input generated by the switching means according to the trajectory of the touch sensor and finger movements in varying directions, then captures and calculates the relevant detection information by the aforementioned means.
[Claim 24] A touch input detection method as claimed in Claims 1-21 comprised of an input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory and a switching means adjacent to the touch detection sensor that turns the contact point on and off, and that receives the event input generated by the switching means according to the trajectory of the touch sensor and finger movements in intersecting

directions, then captures and calculates the relevant detection information by the aforementioned means.

[Claim 25] A touch input detection method as claimed in Claims 1-25 comprised of an input device with multiple touch detection means containing touch sensors continuously arranged along a specific trajectory with either a parallel or simplified parallel arrangement, where the relevant detection information is captured and calculated by the aforementioned means and a means to receive the event input generated by touching another touch detection means using a single trajectory on the touch sensor and finger movement in intersecting directions.

[Claim 26] A touch input detection method comprised of an input device that has at least a touch position detection means with touch position detection sensors arranged continuously along a specific line, plane curve or arc, and a switching means that turns the contact point on and off; and when the touch position detection means is ready and the touch position information is input, if the displaced input is received in the same direction continuously along a specific trajectory, (a) the difference between the first position information and the last position information is calculated as the displacement information (the number of sensors touched or the displaced distance) for the contact point; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) using (a) and (b), the number of sensors touched during displacement or the displaced distance and the displaced direction are output.

[Claim 27] A touch input detection method comprised of an input device that has at least a touch position detection means with a touch position detection sensor arrangement continuously along a specific line, plane curve or arc, and a switching means that turns the contact point on and off; and when the touch position detection means is ready and the touch position information is input, if the displaced input is received in the same direction continuously along a specific trajectory, (a) the difference between the first position information and the last position information is calculated as the displacement information (the number of sensors touched or the displaced distance) for the contact point; (b) the difference between the first position information and the last position information is calculated as the displaced direction information;(c) the result of the number of sensors touched or the displaced distance and the displaced time is calculated as the displaced speed information; (d) using (a), (b) and (c), the number of sensors touched during displacement or the displaced distance, the displaced direction and the displacement speed are output.

[Claim 28] A touch input detection method comprised of an input device that has at least a touch position input part with a finger touch detection means arranged continuously along a specific line,

plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and a switching means that turns the contact point on and off; and when the touch position detection means is ready and is input as the position information for the specific one-dimensional coordinates, and if there is continuous displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) using (a) and (b), the displaced distance for contact point and the displaced direction are output.

[Claim 29] A touch input detection method comprised of an input device that has at least a touch position input part with a finger touch detection means arranged continuously along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and a switching means that turns the contact point on and off; and when the touch position detection means is ready and is input as the position information for the specific one-dimensional coordinates, and if there is displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the number of sensors touched or the displaced distance and the displaced time is calculated as the displaced speed information; (d) using (a), (b) and (c), the displaced distance of the contact point and the displaced direction are output.

[Claim 30] A touch input detection method comprised of an electronic mechanism that has a data pointer for a specific software data table containing at least a touch position input part with a finger touch detection means arranged continuously along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, at least one switching means that turns the contact point on and off and a control means containing a central processing unit; where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;

when the touch position detection means is ready, and when the data pointer is moved on a specific data table, is input as the position information for the specific one-dimensional coordinates, and if there is displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the data pointer is moved to correspond to the number corresponding to the input distance and direction; (d) if the input distance information has the same direction, the data pointer is moved to the previous position; (e) (a), (b), (c) and (d) are performed; (f) if there is a confirmed

input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 31] A touch input detection method comprised of an electronic mechanism that has a data pointer for a specific software data table containing at least a touch position input part with a finger touch detection means arranged continuously along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, at least one switching means that turns the contact point on and off and a control means containing a central processing unit;
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
when the touch position detection means is ready, and when the data pointer is moved on a specific data table, is input as the position information for the specific one-dimensional coordinates, and if there is displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the displaced distance and displaced time is calculated as the displaced speed, (d) the data pointer is moved to correspond to the number corresponding to the input distance and direction; (e) the amount of data pointer movement corresponding to the input speed is modified by movement; (f) if the input distance information has the same direction, the data pointer is moved to the previous position; (g) (a), (b), (c), (d), (e) and (f) are conducted; (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 32] A touch input detection method comprised of an electronic mechanism that has a display means and a cursor to display which of multiple items are currently selected, a touch position input part with a finger touch detection means along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and at least one switching means that turns the contact point on and off;
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
when the touch position detection means is ready, and when the cursor is moved to a specific item, is input as the position information for the specific one-dimensional coordinates, and if there is

displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the cursor is moved to correspond to the number corresponding to the input distance and direction; (d) if the input distance information has the same direction, the cursor is moved to the previous position; (e) (a), (b), (c) and (d) are conducted; (f) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this cursor is conducted.

[Claim 33] A touch input detection method comprised of an electronic mechanism that has a display means and a cursor to display which of multiple items are currently selected, a touch position input part with a finger touch detection means arranged continuously along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and at least one switching means that turns the contact point on and off;
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
when the touch position detection means is ready, and when the cursor is moved to a specific item, is input as the position information for the specific one-dimensional coordinates, and if there is displacement input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the displaced distance and displaced time is calculated as the displaced speed information, (d) the cursor is moved to correspond to the number corresponding to the input distance and direction; (e) the amount of cursor movement corresponding to the input speed is modified by movement; (f) if the input distance information has the same direction, the cursor is moved to the previous position; (g) (a), (b), (c), (d), (e) and (f) are conducted; (g) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this cursor is conducted.
[Claim 34] A touch input detection method comprised of an input device that has a means to conduct decision input by input at a point of contact that is equipped with a display means and a cursor to display which of multiple items are currently selected; a means to detect the touched or released position and time; and a cursor confirmation switch to move the cursor to select multiple items and the volume;
where the touch detection sensors detect each touch and where there are several arranged continuously along a specific line, plane curve or arc and there is a calculation controller that conducts the following when awaiting input and when there is a linear trajectory with linear coordinates,
(a) the time and position of touch or release for each sensor is detected,

(b) the displacement distance between the sensors detected by touch or release is calculated,
(c) the displacement time between the contact point of each sensor detected by touch or release is calculated,
(d) the speed is calculated from each time and distance,
(e) the displacement direction is calculated from the position of each sensor touched or released along a trajectory,
(f) the cursor displacement direction is confirmed from the displacement direction,
(g) the cursor displacement value is confirmed from the displacement distance,
(h) if the distance input has the same direction, the cursor displacement distance is added,
(i) using the designated confirmation switch, the item is confirmed using the cursor
and then the desired item is displayed, selected or confirmed.

[Claim 35] A touch input detection method comprised of an input device that has a means to conduct decision input by input at a point of contact that is equipped with a display means and a cursor to display which of multiple items are currently selected; a means to detect the touched or released position and time; and a cursor confirmation switch to move the cursor to select multiple items and the volume;
where the touch detection sensors detect each touch and where there are several arranged continuously along a specific line, plane curve or arc and there is a calculation controller that conducts the following when awaiting input and when there is a linear trajectory with linear coordinates,
(a) the time and position of touch or release for each sensor is detected,
(b) the displacement distance between the sensors detected by touch or release is calculated,
(c) the displacement time between the contact point of each sensor detected by touch or release is calculated,
(d) the speed is calculated from each time and distance,
(e) the displacement direction is calculated from the position of each sensor touched or released along a trajectory,
(f) the cursor displacement direction is determined from the displacement direction,
(g) the cursor displacement value is determined from the displacement distance,
(h) the cursor displacement distance corresponding to the rate of speed is added,
(i) if the distance input has the same direction, the cursor displacement distance is added,
(j) using the designated confirmation switch, the item is determined using the cursor

and then the desired item is displayed, selected or determined.
[Claim 36] A touch input detection method comprised of at least an electronic mechanism equipped with 2 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detection on two touch detection sensors continuously is deemed one event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;

where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) (a), (b), (c) and (d) are conducted, (f) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.
[Claim 37] A touch input detection method comprised of at least an electronic mechanism equipped with 2 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detection on two touch detection sensors continuously is deemed one event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) the number of events input per unit of time is calculated from time elapsed between the initial event input and the following event input, which becomes the speed information, (f) the amount of displacement of the data pointer corresponding to the input speed information is modified, (g) (a), (b), (c), (d), (e) and (f) are

conducted, (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 38] A touch input detection method as claimed in Claim 36 and Claim 37 that can conduct event input, displacement direction input and displacement speed information calculation when the touch position detection means is ready even when switching from the contact state to the non-contact state.

[Claim 39] A touch input detection method as claimed in Claims 36-38 that has a display means and a cursor to display which of multiple items are currently selected, that synchronize the cursor with the data pointer.

[Claim 40] A touch input detection method comprised of at least an electronic mechanism equipped with 3 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detection on two touch detection sensors continuously is deemed one event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the prepared data pointer movement amount is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor,
(a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) if there is non-adjacent touch sensor input detected, it is considered one event input, (d) if adjacent touch sensor input is detected in the reverse direction, it is considered the final touch sensor input for the previous input, (e) the data pointer is moved to the corresponding number and direction corresponding to the input event, (f) if the event input has the same direction, the data pointer is moved to the previous position, (g) (a), (b), (c), (d), (e) and (f) are conducted, (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 41] A touch input detection method comprised of at least an electronic mechanism equipped with 3 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point

on and off, a control means containing a central processing unit and a data pointer for the specific software data table,

where touch detection on two touch detection sensors continuously is deemed one event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) if there is non-adjacent touch sensor input detected, it is considered one event input, (d) if adjacent touch sensor input is detected in the reverse direction, it is considered the final touch sensor input for the previous input, (e) the data pointer is moved to the corresponding number and direction corresponding to the input event, (f) if the event input has the same direction, the data pointer is moved to the previous position, (g) the number of events input per unit of time is calculated from the time elapsed between the initial event input and the following event input, which becomes the speed information, (h) the amount of movement of the data pointer corresponding to the input speed information is modified, (i) (a), (b), (c), (d), (e), (f), (g), and (h) are conducted, (j) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 42] A touch input detection method as claimed in Claim 40 and Claim 41 that can conduct event input, displacement direction input and displacement speed information calculation when the touch position detection means is ready even when switching from the contact state to the non-contact state.

[Claim 43] A touch input detection method as claimed in Claims 40-42 that has a display means and a cursor to display which of multiple items are currently selected, that synchronize the cursor with the data pointer.

[Claim 44] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with asymmetrically distributed touch detection sensors have a continuous density along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means

containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) (a), (b), (c) and (d) are conducted, (f) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 45] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with asymmetrically distributed touch detection sensors with a continuous density along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data

pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) the number of events input per unit of time is calculated from the time elapsed between the initial event input and the following event input, which becomes the speed information, (f) the amount of movement of the data pointer corresponding to the input speed information is modified, (g) the amount of movement of the data pointer corresponding to the input speed information is modified, (h) (a), (b), (c), (d), (e) and (f) are conducted,

(i) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 46] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with touch detection sensors continuously along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the touch input event setting matches the density of the touch input event generation position or the touch input event generation distance unit when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) (a), (b), (c) and (d) are conducted, (f) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 47] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with touch detection sensors continuously along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount

of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the touch input event setting has the density of the touch input event generation position or the touch input event generation distance unit when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) the number of events input per unit of time is calculated from the time elapsed between the initial event input and the following event input, which becomes the speed information, (f) the amount of movement of the data pointer corresponding to the input speed information is modified, (g) (a), (b), (c), (d), (e) and (f) are conducted, (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 48] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with touch detection sensors continuously along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the density of the touch input event generation position or the touch input event

generation distance unit is set, (d) the data pointer is moved to the corresponding number and direction corresponding to the input event, (e) if the event input has the same direction, the data pointer is moved to the previous position, (f) any or all of (a), (b), (c), (d) and (e) are conducted,

(g) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 49] A touch input detection method comprised of an electronic mechanism that has a touch position detection means with touch detection sensors continuously along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table,
where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event,
where the data pointer displacement direction indicated on the data table sets the touch position displacement direction and the amount of data pointer displacement sets the touch position movement distance;
where the number of events corresponding to the amount of data pointer displacement is established,
when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the density of the touch input event generation position or the touch input event generation distance unit is set, (d) the data pointer is moved to the corresponding number and direction corresponding to the input event, (e) if the event input has the same direction, the data pointer is moved to the previous position, (f) the number of events input per unit of time is calculated from the time elapsed between the initial event input and the following event input, which becomes the speed information, (g) the amount of movement of the data pointer corresponding to the input speed information is modified, (h) all or any of (a), (b), (c), (d), (e) and (f) are conducted, (i) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted.

[Claim 50] A touch input detection method as claimed in Claims 26-49 comprised of a means to modify the touch input event generation position and the touch input event generation distance unit density when there is continuous event input and the distance increases.

[Claim 51] A touch input detection method as claimed in Claims 44-50 that can conduct event input, displacement direction input and displacement speed information calculations when the touch position

detection means is ready even when switching from the contact state to the non-contact state.
[Claim 52] A touch input detection method as claimed in Claims 44-51 that has a display means and a cursor to display which of multiple items are currently selected, that synchronize the cursor with the data pointer.
[Claim 53] A touch input detection method as claimed in Claims 26-52 comprised of the aforementioned input device equipped with an audio generation function and a means to generate audio synchronized with the touch input or the event input.
[Claim 54] A touch input detection method as claimed in Claims 26-52 comprised of the aforementioned input device equipped with a luminophor and a means to generate light using the luminophor synchronized with the touch input or the event input.
[Claim 55] A touch input detection method as claimed in Claims 26-54 comprised of an input device integrated with touch detection sensors and a switching means to turn the contact point on and off that employs the aforementioned touch operation means.
[Claim 56] A touch input detection method as claimed in Claims 26-54 comprised of an input device equipped with a switching means to turn the contact point adjacent to the touch detection sensor on and off, that employs the aforementioned contact operation means, and after the touch operation input is detected and finger movement in a direction different from the trajectory on the touch sensor, the decision input is received from the input on the drive switching means.
[Claim 57] A touch input detection method as claimed in Claims 26-54 comprised of an input device equipped with a switching means to turn the contact point adjacent to the touch detection sensor on and off, that employs the aforementioned contact operation means, and after the touch operation input is detected and finger movement in a direction at right angles to the trajectory on the touch sensor, the decision input is received from the input on the drive switching means.
[Claim 58] A touch input detection method as claimed in Claims 26-54 that conducts sequence or initialization settings to alter the sequence when the touch position detection means is ready.
[Claim 59] A touch input detection method that conducts smooth operations with the tip of a finger on non-contact, contact or pressure sensitive sensors arranged in a string along a 1-dimensional, 2-dimensional or 3-dimensional trajectory; generates events by identifying touch via continuous fingertip actions; and using any or all of these touch events, touch event transition directions and touch event generation numbers, controls the data pointer on the program or the cursor on the display screen; selects the item, data or character;

and executes the confirmation or function of the item, data or character selected using the switching means to turn the contact point on and off.
[Claim 60] A touch input detection method as claimed in Claims 1-59 comprised of a means to conduct arithmetic processing of the aforementioned input information using the arithmetic means transmitting the input event from the switching means detected via touch.
[Claim 61] A touch input detection method as claimed in Claims 1-60 comprised of the aforementioned touch input detection method with touch input event detection, where there is a means to detect single touch input events via continuous touch on either two adjoining touch detection units or two adjoining touch detection sensors.
[Claim 62] A touch input detector that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually come into contact so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded.
[Claim 63] A touch input detector that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually come into contact and with protrusions on the top surface of the moveable contact part so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded.
[Claim 64] A touch input detector that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts in varying densities along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded.
[Claim 65] A touch input detector that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts in varying densities along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch and with protrusions on the top surface of the moveable contact part so that

the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded.

[Detailed Explanation of the Invention]

[0001]

[Industrial Field of Application] This invention relates to an input means (the touch detection input control process) to process displacement information via fingertip movement and touch event input information that is primarily utilized to control input functions on any type of electronic mechanism, that primarily detects finger and other contact as well as pressure, and to any part of the input device utilizing this means.

[0002]

[Existing Art] Currently, there are attempts to make all types of electronic devices, in particular compact electronic devices, more compact as well as multi-functional and high performing with large memory capacities. As a result, to achieve multi-functional compact electronic devices, there are many keys to perform selection key input functions and large volume information search and information input. An example of an input device with a rotating operation type electronic unit (jog dial) and a push switch that can provide multiple functions and high performance with large memory capacities while reducing the large number of key inputs is found in the official gazette for KokaiS8-203387. This is an input device where the rotational angle of the rotating part is input by a rotary encoder. In addition to the displacement angle, the program data pointer is displaced and the function or data selection is performed. The input device where the displacement values are input by contact is a touch panel for position input on an XY plane. Currently, there is a structure for volume that continuously uses a metal contact switch but synchronization is only performed according to the size of the volume received for the touch event from the continuous switch. Regardless of the number of times it is input in the same direction, the continuous input distance in the same direction cannot be added. On the other hand, regardless of the number of times the distance and direction is input on the touch panel, the same is used for adding and processing the input information. This is not something that can create a contact field along a specific trajectory. However, there is no control process to continuously acquire input information on a touch detection unit where there is a touch detection switch on a specific trajectory. Currently, with card type calculator key input, there are film type moveable contacts in rows of two for the matrix type points of contact on the substrate that turn on when the contact points are pressed. This is an input device where the keys are pressed individually and multiple item selection can be conducted by smooth input using fingertips, without requiring algorithms or a processing means. When data is selected, it is not done with the

purpose of data pointer or cursor control, nor for smooth fingertip operation, so there is no input device containing such means.
[0003] This invention is a control method that utilizes an information input device for simultaneous use of touch input along a specific trajectory and confirmation input by a switching means.

This invention is a control method that utilizes an information input device for simultaneous use of a display means to display a cursor to show which of multiple items is currently selected, a touch input along a specific trajectory and a confirmation input using a switching means. Also, this invention is a control method that utilizes an information input device for simultaneous use of a display means to display a cursor to show which of multiple items is currently selected, a touch input along a specific trajectory and a decision input from a switching means integrated with a touch detection means.

[0004]

[Problems this Invention is to Solve]

There is much progress being made with highly integrated microprocessors and memory found in all types of electronic devices that are multi-functional and high performing with large memory capacities. Progress is required for products with fewer hardware parts for more efficient user interface and input. Since a single event input is performed by pressing a push key, there are never enough keys. Also, the number of times it is necessary to press a key to perform many event inputs is extremely high. To avoid this, an input device and a control means to conduct event input continuously using the subtle operation of fingertips is needed for electronic devices. In addition to a hardware structure that can rapidly perform the input of many events, it is also necessary to find solutions for a control means that controls the input events. There is a control process that transmits items by keeping the key pressed down as well as a control process that rapidly transmits according to the time in the pressed down state. However, humans find it easier to understand the movement of a fingertip than to understand the concept of time. This structure involves a touch event detection mechanism with multiple units continuously arranged along a line. A control means is required on the electronic device for efficient use of the touch events. To smoothly select many functions and large amounts of information, it is necessary to invent a control process that coordinates the moveable program data pointer for the software corresponding to function selection with the touch event detection for the hardware. It is also necessary to invent a processing method that controls the continuous data input using a continuous touch detection structure and the movement of a data pointer or cursor. With such a control means, the hardware structure or process to continuously detect touch events for processing would apply to the following.

(1) electrostatic induction process
(2) optical process

(3) direct current resistance detection process
(4) resistant film process
(5) moveable electrode process
(6) moveable contact pressing process

Others include the electromagnetic process and the ultrasonic detection process. With touch detection sensors arranged along a continuous trajectory, capturing the event generated by touch and repeatedly processing it requires a continuous input event control means like turning a dial or a wheel.

[0005]

[Means of Solving These Problems] The first invention of this invention solves the aforementioned problems with an input device that has a touch detection means equipped with touch detection sensors continuously arranged along a specific line, plane curve or arc; a means to capture physical phenomena generated via touch and that has a means to continuously add or subtract the physical quantity by replacing the physical phenomena repeatedly input by touch with scalar quantity information and vector quantity information. The second invention of this invention solves the aforementioned problems with an input device that has a touch detection means equipped with touch detection sensors continuously arranged along a specific line, plane curve or arc; a means to capture the distance and direction of the repeated input by touch along a trajectory. The third invention of this invention solves the aforementioned problems with an input device that has a touch detection means equipped with touch detection sensors continuously arranged along a specific line, plane curve or arc; a means to capture the length, time and direction input repeatedly by touch along a trajectory and a means to calculate the speed from the distance and time. The fourth invention of this invention solves the aforementioned problems with an input device that has a touch detection means equipped with touch detection sensors continuously arranged along a specific line, plane curve or arc; a means to capture the distance, time and direction input repeatedly by touch along a trajectory and a means to calculate the speed from the distance, time and direction.

The fifth invention of this invention solves the aforementioned problems with an input device that has a touch detection means equipped with touch detection sensors continuously arranged along a specific line, plane curve or arc; a means to capture the distance, time and direction input repeatedly by touch along a trajectory, a means to calculate the speed from the distance, time and direction and a means to calculate the acceleration from the speed. The sixth invention of this invention solves the aforementioned problems with an integrated input device that has multiple touch detection means with either a parallel or simplified parallel arrangement that are equipped with touch detection sensors continuously arranged along a

specific line, plane curve or arc, that can use the aforementioned means to capture and calculate relevant detection information. The seventh invention of this invention solves the aforementioned problems with an input device that has a continuous touch detection means equipped with keys containing touch detection sensors along a specific line, plane curve or arc, that can use the aforementioned means to capture and calculate relevant detection information.

The eighth invention of this invention solves the aforementioned problem where instead of the aforementioned touch input detection, the information generated between the contact state and the non-contact state applies to the aforementioned means. The ninth invention of this invention solves the aforementioned problem where in addition to the information generated from the aforementioned touch input, the information generated between the contact state and the non-contact state applies to the aforementioned means. The tenth invention of this invention solves the aforementioned problem where instead of the aforementioned distance information input, the number of events generated via sensor detection is employed and the number of events for each unit of time is substituted for the speed, velocity and acceleration.

[0006] The eleventh invention of this invention solves the aforementioned problem where the aforementioned touch detection means with non-uniformly distributed touch detection sensors have a continuous density along a specific trajectory, that can use the aforementioned means to capture and calculate relevant detection information. The twelfth invention of this invention solves the aforementioned problem where the aforementioned touch detection means has uniformly distributed touch detection sensors along a specific trajectory, that has touch input event generation positions or generation intervals that are set at varying densities and that can use the aforementioned means to capture and calculate relevant detection information. The thirteenth invention of this invention solves the aforementioned problem where the aforementioned touch detection means has uniformly distributed touch detection sensors along a specific trajectory, and can simultaneously use the aforementioned means to capture and calculate relevant detection information as well as alter the touch input event generation positions or generation intervals that are set at varying densities according to the speed, velocity and acceleration. The fourteenth invention of this invention solves the aforementioned problems with an input device with a continuous finger touch detection means along a specific trajectory that has a detection means for one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, that can apply the aforementioned for detection of input information as one-dimensional coordinate position information. The fifteenth invention of this invention solves the aforementioned problems with an input device with a continuous finger touch detection means along a specific trajectory and a control means containing an arithmetic processor and an electronic mechanism that has a data pointer for a specific data table on the software, where the results of the calculations conducted on this means are

synchronized with the data pointer and that can be shifted or fast-forwarded. The sixteenth invention of this invention solves the aforementioned problems with an electronic mechanism with a display means and a cursor to display which of multiple items are currently selected, and a continuous finger touch detection means along a specific trajectory, where the results of the calculations conducted on this means are synchronized with the cursor and that can be shifted, fast-forwarded and displayed. The seventeenth invention of this invention solves the aforementioned problems with an input device equipped with an audio generation function and a means to generate audio synchronized with the capture, calculation and input of relevant detection information by the aforementioned means. The eighteenth invention of this invention solves the aforementioned problems with an input device equipped with a luminophor and a means to generate light using the luminophor synchronized with the capture, calculation and input of relevant detection information by the aforementioned means. The nineteenth invention of this invention solves the aforementioned problems with a means to capture and calculate touch input by finger movement or touch as well as an event detection means that differs from the input means by continuous multiple touch in the same position. The twentieth invention of this invention solves the aforementioned problems with an input device equipped with at least one switching means to turn the point of contact on and off, and an event input means that captures and calculates the relevant detection information by the aforementioned means using the switching means.

[0007] The twenty-first invention of this invention solves the aforementioned problems with a means to capture event input from the switching means if the switching means is constructed of a touch sensor. The twenty-second invention of this invention solves the aforementioned problems with an integrated input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory and a switching means to turn the point of contact on and off, with a means to capture and calculate the relevant detection information by the aforementioned means. The twenty-third invention of this invention solves the aforementioned problems with an input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory and a switching means in the vicinity of the touch detection sensor that turns the contact point on and off, and that receives the event input generated by the switching means according to the trajectory of the touch sensor and finger movements in varying directions, then captures and calculates the relevant detection information by the aforementioned means. The twenty-fourth invention of this invention solves the aforementioned problems with an input device with a touch detection means containing touch detection sensors continuously arranged along a specific trajectory

and a switching means in the vicinity of the touch detection sensor that turns the contact point on and off, and that receives the event input generated by the switching means according to the trajectory of the touch sensor and finger movements in intersecting directions, then captures and calculates the relevant detection information by the aforementioned means. The twenty-fifth invention of this invention solves the aforementioned problems with an input device with multiple touch detection means containing touch sensors along a specific trajectory that have either a parallel or simplified parallel arrangement,

where the relevant detection information is captured and calculated by the aforementioned means and a means to receive the event input generated by touching another touch detection means using a single trajectory on the touch sensor and finger movement in intersecting directions. The twenty-sixth invention of this invention solves the aforementioned problems with an input means where there are 2 or 3 or more touch sensors in a row and by touching these sensors in order, the detection of the 2 sensors is a single contact event. The twenty-seventh invention of this invention solves the aforementioned problems with a means to process input information using an operation means for receiving transmissions via a transmission means for the touch input events from touch detection and the input events from the switching means. The touch detection sensors for contact input can solve the aforementioned problems with output signals or voltage corresponding to the touch position by contact or pressure for detection calculations using the aforementioned means. The voltage or signals for distance, speed, velocity and acceleration can be directly identified as physical quantities. A timer or clock can identify the time element. Sensor placement can identify the direction.

[0008] The twenty-eighth invention of this invention solves the aforementioned problems with a touch input detector that is comprised of a display means and a cursor to display which of multiple items are currently selected, that is equipped with moveable contacts along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded. The twenty-ninth invention of this invention solves the aforementioned problems with a touch input detector that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch and with protrusions on the top surface of the moveable contact part so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded. The thirtieth invention of this invention solves the aforementioned problems with a touch input detection method that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts in varying densities along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch so that the cursor

can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded. The thirty-first invention of this invention solves the aforementioned problems with a touch input detection method that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts in varying densities along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded.

[0009]

[Operation] With the first invention, it is possible to continuously control multiple input events repeating the scalar and vector information (time, distance, direction, speed, velocity or acceleration information) generated from a fingertip touching and moving along touch detection sensors on a trajectory. Continuous input event control is possible by turning a dial or a wheel. With the second invention, it is possible to control continuous input events by continuously gathering distance and direction information generated from a fingertip touching and moving along touch detection sensors on a trajectory. With the third invention, it is possible to control continuous input events by continuously gathering distance and direction information generated from a fingertip touching and moving along touch detection sensors on a trajectory and calculating the speed. In particular, it is possible to fast-forward the data pointer or cursor by identifying the speed. With the fourth invention, it is possible to control continuous input events by continuously gathering distance, direction and time information generated from a fingertip touching and moving along touch detection sensors on a trajectory and calculating the velocity. In particular, it is possible to fast-forward the data pointer or cursor by identifying the velocity. With the fifth invention, it is possible to control continuous input events by continuously gathering distance, direction and time information generated from a fingertip touching and moving along touch detection sensors on a trajectory and calculating the speed and velocity.

In particular, it is possible to fast-forward the data pointer or cursor by identifying the acceleration. With the sixth invention, it is possible to simultaneously gather continuous distance information or event information by conducting search or operation with the fingers on multiple sensors in a parallel or simplified arrangement. Thus it is possible to more precisely detect the fingertip movement amount or number of events with uniform circular processing on the aforementioned means. With the seventh invention, there is an input device with keys equipped with touch detection sensors situated along a specific line or plane curve that makes it possible to have an input function for analog information for separate push keys using the aforementioned means. With the eighth invention, since it is possible to detect events even when separated from where the finger makes contact, it is possible to control this. With the ninth invention, it is possible to control continuously input events by detecting events even when separated from where the finger makes contact. With the tenth invention, for example, if the sensor arrangement is asymmetrical, the number of input events is not compared to the distance so the number of touch events per unit of time replaces the distance so the calculation can be conducted, and thus it is possible to control continuously input events.
[0010] With the eleventh invention, it is possible for the operator to modify the number of input events by the touch of a fingertip due to the non-uniform arrangement of touch detection sensors with varying densities. With the twelfth invention, it is possible for the operator to modify the number of input events by the touch of a fingertip due to the non-uniform initial setting via the software. With the thirteenth invention, it is possible for the operator to modify the number of input events by the touch of a fingertip by converting the dynamic event generation point or the generation unit corresponding to the input speed, velocity or acceleration. With the fourteenth invention, it is possible to control continuous input events by identifying the input information by comparison with the one-dimensional coordinates via sensors arranged along a trajectory. With the fifteenth invention, it is possible to use data pointer control on the application software data table for information obtained on the electronic device containing a CPU or MPU. Thus it is possible to continuously process data, select items or select functions. With the sixteenth invention, it is possible to see the operation that synchronizes the data pointer with the cursor on the display. With the sixteenth invention, it is easy for the operator to identify the continuous input events by controlling the audio generation function. With the sixteenth invention, it is easy for the operator to identify the continuous input events by controlling the

luminous function. With the nineteenth invention, there can be dynamic decision input function due to the ability to trigger the same event by clicking due to continued touch in the same area. With the twentieth invention, there can be dynamic decision input function due to the ability to trigger the same event by clicking due to the switching means on the input device that is separate from the touch detection means mentioned above.

[0011] With the twenty-first invention, the input device has an extremely thin structure that can include both the continuous touch detector and the decision input switch part. This input device has a greatly improved input function because the card style electronic device includes the means mentioned above. With the twenty-second invention, the input device unitizes the touch detection means along a trajectory and the switching means making it possible to perform decision input without moving the finger immediately after performing contact detection using the means mentioned above. Therefore, this approximates the operating function in the official gazette for KokaiH8-203387 for a rotating electronic part (jog dial) equipped with a push switch. With the twenty-third invention, it is possible to conduct decision input by simply moving a finger to the position on the adjacent switching means immediately after contact detection using the aforementioned means on the input device equipped with a switching means adjacent to the touch detection sensor. With the twenty-fourth invention, it is possible to conduct decision input by simply sliding a finger sideways to the position on the adjacent switching means immediately after contact detection using the aforementioned means on the input device equipped with a switching means adjacent to the touch detection sensor. With the twenty-fifth invention, it is possible to capture a decision input or a new input event by simply sliding a finger sideways to the position on the adjacent switching means immediately after contact detection using the aforementioned means on the input device equipped with parallel or simplified parallel arrangement of multiple touch detection means. With the twenty-sixth invention, it is possible to control input event detection with few touch detection sensors if using the aforementioned means due to the ability to capture contact events with two or more detection sensors. With the twenty-seventh invention, it is possible to conduct remote control operation of multiple input items with a means to process input information via a transmission and receiving means for touch input events, touch events and input events from the switching means. This is effective for conducting multiple item selection or decisions via transmission of luminous elements and light receiving elements on the transmission means. This is also effective with non-contact type identification devices that transmit information to respond to the currently available electric waves. With the twenty-eighth and twenty-ninth

inventions, an input function exists on the thin style input device such as an IC card type credit card that has a liquid crystal display

and it is possible to demonstrate a flat rotating operation type input device. With the thirtieth and thirty-first inventions, an input function exists on the thin style input device such as an IC card type credit card that has a liquid crystal display and since it is possible to demonstrate a flat rotating operation type input device, it is possible to modify the number of input events by the slight touch of a fingertip via varying degrees of detection density.
[0012] The structure of the hardware in this invention is described in the following order.

1) Example of touch event detection circuit structure using touch position detection sensors
2) Example of an input device with touch position detection sensors arranged continuously along a specific line, plane curve or arc
3) Example of the electronic mechanism on the input device
4) Example of the system circuitry on the input device

Next, is a description of the embodiment examples for the touch input detection method.

5) Description of the operation of the embodiment examples
6) Detailed description of the processing means
7) Embodiment examples of the touch input detector

[0013] The embodiment examples for this invention are described below, using the figures as references.
1) Example of touch event detection circuit structure using touch position detection sensors. The touch event detection circuitry using specific touch detection sensors is as follows. This is a circuit that outputs signals or voltage for a position touched according to contact or pressure.
[0014] The structure using an electrostatic induction detection means (electrostatic capacity) as the touch position detection means of the touch detection sensor involves a detection method that has multiple capacitors C1, C2, C3....through non-conductive glass for detecting contact via fingers where the capacity of these capacitors C1, C2, C3....changes according to the touch or proximity. These capacitors C1, C2, C3....are connected. As shown in Figure 1,
there is a pulse generation circuit 1 that transmits frequency signals generated by the CR phase transmission circuit 3 by the voltage through the scanning drive circuit 2 that houses a decoder and counter to the frequency comparison circuit 4. These signals are compared with standard signals transmitted to the frequency comparison circuit 4 via the control circuit 5 from the pulse generation circuit 1. The signals from the frequency comparison circuit 4 and the standard signals from the control circuit 5 are simultaneously transmitted to the decision circuit 6. Based on the

decision for both signals, the capacitor capacity is detected by the changes in touch at the point of finger contact.

[0015] Next is a description of the structure using an optical detection means (infrared detection type) as the touch position detection means of the touch detection sensor. This is a method that performs finger touch detection as shown in Figure 2. There are luminous elements 7 such as LED and light receiving elements 8 such as phototransistors that are arranged 1:1 along the keypad. These light receiving elements 8 light up sequentially according to the demultiplexer 9 and the light is simultaneously received by the light receiving elements 8 via the multiplexer 9. The luminescence of the light received by these light receiving elements 8 is detected by the decision circuit 6. Based on the decision of the level of light, the finger touch position is detected. 12 refers to the control circuit that is connected to the demultiplexer 9, the multiplexer 10, and the decision circuit 6 that control the circuit functions. The dotted line box in Figure 2 is the AD converter 13 that can be in between the multiplexer 10 and the decision circuit 11. Analog value detection can be conducted by the point of contact to improve the detection accuracy.

[0016] Next is a description of the structure using a direct current resistance detection method as the touch position detection means of the touch detection sensor. There are metal contacts for the touch position to perform finger contact detection. The detection circuit shown in Figure 4 detects the high level of resistance such as a finger contact extending between the metal contact point switches SW1~SW7 with 2MΩ of input resistance. The high resistance detection terminal switch module SM converts the output level OUT1~OUT7 to 2 HIGH, LOW values that are used as the switches to detect when the metal is touched.

[0017] Next is a description of the structure using a resistant film type detection means (resistant film electrode type) as the touch position detection means of the touch detection sensor. As shown in Figure 6, a standard resistant film 15 is sandwiched between the electrode A and electrode B. This generates the potential distribution Q of the drive voltage and grounded voltage. As shown in Figure 7, the electrode 16 that is conductive to this resistant film 15 is installed in a parallel direction either under or on top of the resistant film 15. When touched with a finger, there is contact between the resistant film 15 and the electrode 16. This contact detects the position of the point of contact by measuring the changed voltage on the voltage measuring device 17. With any type of detection means as described above, the point of contact is output as position data with one-dimensional coordinates that correspond 1:1 to its trajectory. In particular, using the analog method, if close enough, it is possible to easily identify the direction of the

fingertip movement and with the digital method, it is possible to identify if there are many points.

[0018] Next is a description of the structure using a moveable electrode style detection means (moveable electrode switch type) as the touch position detection means of the touch detection sensor.

As shown in Figure 8(a), either the electrode with a linear arrangement along a trajectory or the electrode arranged intermittently with gaps filled with spacers 21 is designated as the moveable electrode 22 while the other is designated the stationery electrode 23. Using the finger, pressure is applied to the moveable electrode 22 to contact the stationary electrode 23 side. The position and time of the point of contact is used to detect the finger contact point. In Figure 8(b), the counter 19 is activated by the control circuit 18 to sequentially detect the points of contact S1, S2, S3 from the decoder 20. At this point, the part of the contact point that is ON has LOW voltage to detect the point of contact. This is nearly the same method as the moveable electrode method but the structure of the contact points is streamlined from the use of moveable contact points with 2 stationery electrodes. It is also possible to utilize electrostatic induction or ultrasonic detection as the touch detection method.

[0019] 2) Example of an input device with touch position detection sensors arranged continuously along a specific line, plane curve or arc

The contact operation type input device is as follows. This is a device that outputs signals or voltage for a position touched according to contact or pressure. The touch position detection sensors 24 on the contact operation type input device are arranged as shown in Figure 9(a) along a straight line or as shown in Figure 9(b) along a curved line. There is a switch 25 next to them. There are multiple arrangements such as the cross-shaped touch sensors shown in (c) or the varying densities shown in (d). As shown in Figure 10, there are touch position sensors 24 arranged along a straight line or a curved line that can be moved horizontally within a given range. The electrical signal or voltage from this touch position detector 34 and sensor 24 becomes the conduction path. There is a flexible contact skid 26 on the substrate 29 equipped with contact points. In the normal state, the touch position detector 34 is pressed horizontally to the spring 33. There is a push switch 27 on the substrate 29 equipped with contact points that press on the touch position detector 34 against the spring 33.

[0020] As shown in Figure 11(a), the touch position detector 34 with touch position detection sensors 24 arranged along a straight line or a curved line is connected to the holder 36 containing the pressure switch by the column shaped or pipe shaped connector 38. There is a spring or an elastic body inside the holder 36 that turns the contact point ON and OFF by pressing down when there is pressure from above in a specific direction. Figure 11(b) has two touch sensors 37 and (c) has 3. The conduction path can have cables or flexible contact

points inside the connector 38. Exterior cables 35 as shown in the figure are also acceptable. As shown in Figure 12(a), it is possible to apply pressure to the entire detector on the touch position detection sensor 40 around a circular path. There can be a switch 39 in the center of this circle. As shown in Figure 13, there can be contact points on elastic sensors or moveable contacts. In Figure 14, if there are two push switches, the touch position detector 34 equipped with touch position detection sensors 24 along a straight line or a curved line is touched with a fingertip. There is a cable 35 that acts as the conduction path for the touch position detector 34 and a touch position detector 34 that generates the electrical signal or voltage corresponding to the touch position detection sensor 24. There is also an upright coil shaped spring 33. When sufficient pressure is applied from the top, the spring 33 resists the force while it presses on the push switch 27A. The touch position input can freely swing sideways anchored by the plate spring 33B. When there is pressure from a diagonal direction, the two push switches 27A are triggered. The touch position detection sensors can involve uniform distribution as shown in Figure 15(a), non-uniform density increasing in a given direction with the highest density at the ends as shown in (b), non-uniform distribution in a circle with varying densities as shown in (c), or gradually increasing densities in a given direction as shown in (d). There are many structures with multiple trajectories with the same or different displacement units. The touch position detection sensors arranged along a straight line or a curved line can be constructed as shown in Figure 16(a) with touch position detection sensors 24 to detect a single touch on the top of the key, or as shown in (b) with multiple touch detection sensors, or as shown in (c) with touch pads 24. The conduction path can be cables or flexible contact points inside the connector or external parts as shown in (d). It is possible to utilize the contact detection method in this invention arranged along a trajectory.
[0021] 3) Example of the electronic mechanism on the input device
As shown in Figure 17(a), this is an example of a portable single electronic mechanism for an input device that is the horizontal line in the center of the front. In (b), there is a vertical touch position detection sensor in the center of the front. In (c), there is also a switching means in a curved line in the center of the front. As shown in Figure 17(d), it can be on a curved line located on the top of the side of the device where it can be operated easily with the thumb. In (e), there is a sliding switching means that can be easily pressed with the finger and the thumb. (f) has a vertical touch detection sensor on the side of the device and a switching means that can be activated by sliding a finger vertically.

Figure 18(a) is a circular touch position detection sensor in the center of the front of the device. In Figure 18(b) it is located on the side of the box shape. Figures 18(c), (d) and (e) are examples of the input means in this invention for a card type electronic mechanism that cannot utilize a rotating operational electronic part (such as a jog dial). For the display means, liquid crystal display means are installed and as shown in Figure 18(c), there are varying densities of touch detection sensors on the right side of the device. In (d), there are two rows where it is acceptable to change the touch detection density and in (e) it is round. Moveable contacts can be added to this card type. In this case, a switching means and a switch for the moveable contact is recommended. As shown in (f), this type of card can be easily operated by holding in a hand and using the thumbs to slide along the surface of the card. In Figure 19, the touch position detection sensor is located on the tops of the keys and the touch event or movement distance is input by extending the fingertips between the tops of the keys. Figure 19(a) shows a column on the buttons on the surface of the device while (b) shows a cross, (c) shows two columns and (d) shows three rows or radial lines.
[0022] 4) Example of the system circuitry on the input device
This is an example of the application system circuitry in the input processing means. As shown in Figure 20, the electrical signal or voltage of a touch input via a finger occurring on a touch position detection sensor 24 is detected by the touch detection circuit 49. It is identified by the operation control circuit 48 (this can include CPU, DSP, MPU or memory) and depending on the situation, the cursor is shown via the display circuit. Depending on the processing, audio is heard from the speakers 46 via the audio circuit 47 and light can be generated from the luminophor 51. If the application system is not housed in the operation control circuit 48, information output to the application system is conducted. If the application system is housed in the operation control circuit, linear output is not performed.
[0023] Embodiment examples for the touch input detection method
Next are details of the embodiment examples for the touch input detection method.
5) Description of the operation of the embodiment examples
Next are details of the embodiment example for the touch input detection method in this invention regarding user interface from an operating standpoint. For example, with a touch input detection method containing an electronic mechanism that has a display means and a cursor to display which of multiple items are currently selected, a touch position input part with a continuous finger touch detection means along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding

1:1 to the contact point and its trajectory, and at least one switching means that turns the contact point on and off, the remote control is as shown in Figure 21. The remote control in Figure 21 has information input from the touch sensor 24 and switch 25 and is transmitted to the side of the device via the luminous element 53. At the time of input, the speaker 46 or the liquid crystal display 45 identifies the operational status. During the touch input ready state, this controller awaits for selection from 26 functions (functions 1-26 are AAA, BBB, CCC....YYY, ZZZ). As shown in Figure 22, to select function 16 PPP, the unit is held in the left hand and the touch sensor 24 is pressed with the thumb from the left to the right. The cursor 52 moves down the screen synchronized with the data pointer on the program movement. To select 16 PPP as the function, the data pointer and cursor 52 are scrolled down and the thumb is completely removed to the left from the touch detector. The thumb then moves the touch detector to the right. By doing this, the data pointer and cursor scrolls down. If scrolled too far, the touch detector can be moved from the right to the left with the thumb. When the cursor reaches the 16^{th} function PPP, the thumb moves down to press the confirmation switch 25. Then an infrared function issuance signal is output by the LED 53 on the controller. The cursor identifies the speed of the finger movement and can follow multiple functions. Since the operation and processing of this function selection and function performance is well known, the structure inside the LED controller is not described in detail. Briefly, the LED, microprocessor and memory (ROM, RAM) execute the control software. In the example above, the cursor or data pointer are moved down with left-right motion but it can also be set to move in the opposite direction from right to left where the cursor or data pointer are set to move from to bottom to the top. Depending on the location of the varying densities of touch detection sensors touched with a finger, the amount of cursor or data pointer movement can be altered. With varying densities, the item event corresponding to the amount of fingertip movement is not input, but the cursor or data pointer are moved according to the number of sensor touch events touched by the fingertip. The item event inputs received correspond to the amount of movement and the number of touch events.

[0024] The example of the controller device in Figure 26 is an example using the switch type touch operation electronic part with touch detection sensors in a circle as described in Figure 12(A). Here the first 8 function data items relate to the display (AAA, BBB, CCC, DDD, EEE, FFF, GGG, HHH) and the 7 function items after selection (AA1, AA2, AA3, AA4, AA5, AA6, AA7) have a tree structure. BBB (BB1, BB2,...BB7) and CCC are identical. The description of the input processing shows the sequence of function FF6. Figure 26 is the initial state awaiting function selection. As shown in Figures 27 and 28, the thumb is used for clockwise rotation to move the cursor or data pointer down. With continuous clockwise rotation, the cursor or data pointer will cycle as AAA>BBB>CCC>DDD>EEE>FFF>GGG>HHH>AAA>BBB>CCC. As shown in Figure 29, when rotating in the reverse direction, it will cycle as AAA>HHH>GGG>FFF>EEE>DDD>CCC>BBB>AAA>HHH>GGG>FFF. To stop, either remove the finger from the sensor or continue moving the cursor in the same direction. After the cursor is moved to FFF, the switch 39 in the center of the touch operation style electronic part is pressed to select the function FFF and then the functions FF1 to FF7 appear in the screen for selection by the data pointer or cursor. As shown in Figure 31, FF6 is selected from FF1-FF7 and as shown in Figure 32, pressing the switch 39 in the center outputs a function issuance signal from the LED on the controller for the function selected on the controller. It is also acceptable to select a different function data by rotation in the opposite direction. It can be right-handed or left-handed so it can be change to rotate in either direction during the initial setting.

[0025] The example in Figure 33 is a controller with keys in a grid that have touch detection sensors on the top of the keys as shown in Figure 16. The cursor appears on the display screen and the detectors are as shown in (b) and (c). When touched and moved with the thumb on the tops of the keys from the top to the bottom, the cursor or data pointer scrolls down. When the cursor moves to the function desired, the key touched is pressed as shown in (d). This selects the function. The function decision can also be done via a method with a push switch. Figure 34 shown an example of the data pointer movement during touch input detection. If awaiting touch detection input (ready state), first the contact point is moved along touch detection sensors continuously arranged. As shown in Figure 34(a), when the contact points are moved from 3-7, the program data pointer moves from 1-5. When the contact points are moved from 2-5 in the same direction, the data pointer moves from 5-8. If the contact points are moved in the reverse direction from 9-3, the data pointer moves from 8-2. Data table processing is as shown in Figure 34(b) from 1-100.

The data pointer cannot go above this range as after 100, the range returns to 1 and the data pointer also returns. This processing is conducted by the touch detector and is identical to analog data input processing conducted by turning a wheel dial. If a specific value for the finger contact point speed or the amount of input per touch event unit of time is exceeded, the amount of movement per data pointer unit can be increased in the invention. The invention includes data pointer displacement that corresponds to the distance of the contact point movement and the movement corresponding to a single or multiple touch events. Also, contact point detection can be increased by calculating the finger position that identifies the length of the line corresponding to the area of contact.

[0026] Detailed description of the processing means

Next is a description of the example of the processing means in this invention. With an input device that contains a touch position detection means equipped with touch position detection sensors arranged along a specific line, plane curve or arc and at least one switching means that turns the contact point on and off, and when the touch position detection means is ready and the touch position information is input, if the displaced input is continuously received in the same direction along a specific trajectory, (a) the difference between the first position information and the last position information is calculated as the displacement information (the number of sensors touched or the displaced distance) for the contact point; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; the result of the number of sensors touched or the displaced distance and the displaced time is calculated as the displaced speed information; (d) using (a), (b) and (c), the number of sensors touched during displacement or the displaced distance, the displaced direction and the displacement speed are output so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively.

[0027] As another example, with an input device that contains a touch position input part with a continuous finger touch detection means along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and a switching means that turns the contact point on and off; and when the touch position detection means is ready and is input as the position information for the specific one-dimensional coordinates, and if there is continuous displaced input in a uniform direction,

(a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the number of sensors touched or the displaced distance and the displaced time is calculated as the displaced speed information; (d) using (a), (b) and (c), the displaced distance for the contact points, the displaced direction and the displacement speed are output so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively.

[0028] As a different example relating to the data pointer control, with an electronic mechanism that has a data pointer for a specific software data table containing at least a touch position input part with a continuous finger touch detection means along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, at least one switching means that turns the contact point on and off and a control means containing a central processing unit; where the data pointer movement on the prepared data table determines the movement direction of the touch position and the amount of prepared data pointer movement determines the touch position movement distance;

when the touch position detection means is ready, and when the data pointer is moved on a specific data table, is input as the position information for the specific one-dimensional coordinates, and if there is continuous displaced input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the displaced distance and displaced time is calculated as the displaced speed; (d) the data pointer is moved to the corresponding number and direction corresponding to the input event, (e) the amount of the data pointer movement corresponding to the input speed is modified; (f) if the event input has the same direction, the data pointer is moved to the previous position, (f) (a), (b), (c), (d), (e) and (f) are conducted, (g) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively.

[0029] As a different example relating to the cursor control, with an electronic mechanism that has a display means and a cursor to display which of multiple items are currently selected, a touch position input part with a continuous finger touch detection means along a specific line, plane curve or arc that can detect one-dimensional coordinate position information corresponding 1:1 to the contact point and its trajectory, and at least one switching means that turns the contact point on and off;
where the cursor displacement direction is confirmed and the cursor displacement distance is confirmed;
when the touch position detection means is ready, and when the cursor is moved on a specific item, is input as the position information for the specific one-dimensional coordinates, and if there is continuous displaced input in a uniform direction, (a) the difference between the first position information and the last position information is calculated as the displaced distance information; (b) the difference between the first position information and the last position information is calculated as the displaced direction information; (c) the result of the displaced distance and displaced time is calculated as the displaced speed information, (d) the cursor is moved to correspond to the number corresponding to the input distance and direction; (e) the amount of cursor movement corresponding to the input speed is modified by movement; (f) if the input distance information has the same direction, the cursor is moved to the previous position; (g) (a), (b), (c), (d), (e) and (f) are conducted; (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this cursor is conducted so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively.
[0030] As another example, with a touch input detection method comprised of at least an electronic mechanism equipped with 2 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table, where touch detection on two touch detection sensors continuously is deemed one event, where the data pointer displacement on the data table determines the displacement direction of the touch position and the amount of data pointer displacement determines the touch position displacement distance; where the number of events corresponding to the data pointer movement amount is established, when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final

touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) the number of events input per unit of time is calculated from time elapsed between the initial event input and the following event input, which becomes the speed information, (f) the amount of movement of the data pointer corresponding to the input speed information is modified, (g) (a), (b), (c), (d), (e) and (f) are conducted,

(h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this cursor is conducted so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively. In this example, the displaced direction input and displaced speed information calculation when the touch position detection means is ready even when switching from the contact state to the non-contact state, there is a display means and a cursor to display which of multiple items are currently selected, that can synchronize the cursor with the data pointer.

[0031] As another example, with an electronic mechanism equipped with 2 touch position detection means adjacent to the touch detection sensors to detect a single touch independently, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table, where touch detection on two touch detection sensors continuously is deemed one event, where the data pointer movement on the prepared data table determines the movement direction of the touch position and the amount of prepared data pointer movement determines the touch position movement distance; where the number of events corresponding to the prepared data pointer movement amount is established, when the touch position detection means is ready, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) if there is non-adjacent touch sensor input detected, it is considered one event input, (d) if adjacent touch sensor input is detected in the reverse direction, it is considered the final touch sensor input for the previous input, (e) the data pointer is moved to the corresponding number and direction corresponding to the input event, (f) if the event input has the same direction, the data pointer is moved to the previous position, (g) the number of events input per unit of time is calculated from time elapsed between the initial event input and the following event input, which becomes the speed information, (h) the amount of movement of the data pointer corresponding to the input speed information is modified, (i) (a), (b), (c), (d), (e), (f), (g) and (h) are conducted, (j) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted so the aforementioned input device or the electronic mechanism containing this input device can conduct

continuous event input effectively. In this example, the displaced direction input and displaced speed information calculation when the touch position detection means is ready even when switching from the contact state to the non-contact state, there is a display means and a cursor to display which of multiple items are currently selected that can synchronize the cursor with the data pointer.

[0032] As another example, with an electronic mechanism that has a touch position detection means with touch detection sensors that have a continuous density along a specific line, plane curve or arc, at least one switching means to turn the contact point on and off, a control means containing a central processing unit and a data pointer for the specific software data table, where touch detected continuously on multiple touch detection sensors or where touch position moved a specific distance is considered a single event, where the data pointer movement on the prepared data table determines the movement direction of the touch position and the amount of prepared data pointer movement determines the touch position movement distance; where the number of events corresponding to the prepared data pointer movement amount is established, when the touch position detection means is ready, the non-uniform density of the touch input event generation position and touch input event generation distance unit is set by setting the touch input event, when the data pointer is moved on a specific data table, and when there is touch input sequentially and continuously on the touch detection sensor, (a) the initial touch detection sensor input and the following touch detection sensor input is detected as one event input, (b) the final touch detection sensor input and the following touch detection sensor input detects the displaced input direction in order, (c) the data pointer is moved to the corresponding number and direction corresponding to the input event, (d) if the event input has the same direction, the data pointer is moved to the previous position, (e) the number of events input per unit of time is calculated from time elapsed between the initial event input and the following event input, which becomes the speed information, (f) the amount of movement of the data pointer corresponding to the input speed information is modified, (g) (a), (b), (c), (d), (e) and (f) are conducted, (h) if there is a confirmed input by the switching means, execution of the data selection or function indicated by this data pointer is conducted so the aforementioned input device or the electronic mechanism containing this input device can conduct continuous event input effectively.

[0033] In addition to the processing means described above, it is possible to add a means to generate audio that is synchronized with the touch input or event input to the input device containing the input device as described above and an audio generation function. It is possible to add a means to generate light via a luminophor that is synchronized with the touch input or event input to the input device

containing the input device as described above and a luminophor. It is possible to use the aforementioned touch operation means as the input device where the touch detection sensor and switching means to turn the contact point on and off are integrated. For the input device equipped with a switching means to turn the contact point next to the touch detection sensor on and off, it is possible to capture the decision input of the input from the switching means triggered by a finger it is moved in a direction different from the touch sensor after touch operation input detection using the aforementioned contact operation means.

For the input device equipped with a switching means to turn the contact point next to the touch detection sensor on and off, it is possible to capture the input of the switching means triggered by a finger after the finger was moved in a direction perpendicular to that of the touch sensor during touch operation input detection. It is also possible to alter the sequence or the sequence in which the initial setting is conducted to make the touch position detection means more effective.

[0034] If part of the aforementioned processing means is replaced by an electronic circuit but contains the same processing means, it is the same as this invention. If the sequence executed by the program processing on the aforementioned processing means is changed, it is the same as this invention. If part of the processing executed by the program processing of the aforementioned processing means is shared processing, or by the driver routine or by ROMBIOS, these processing means are the same as this invention. If the program processing executed by the aforementioned processing means is divided into multitask processing but contains the same processing means, it is the same as this invention. If the aforementioned processing means is executed by the operating system but contains the same processing means, it is the same as this invention. If the aforementioned processing means is executed by application software but contains the same processing means, it is the same as this invention. When only event input is conducted with the aforementioned processing means using the device where the sensor and receiving means are on the side, processing can be conducted using the transmitting/receiving device and even if the execution of the distribution of the processing means for each transmitting/receiving device is conducted, if it includes the same processing means, it is the same as this invention.

[0035] Embodiment examples of the touch input detector

Next, in the embodiment example for this invention, there is a touch input detection method that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch, with protrusions on the top surface of the moveable contact part so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded. As shown in Figure 35, this has nearly the same configuration as the aforementioned moveable electrode method but the moveable contact method is utilized as the touch position detection means on the touch detection sensor. By touching the

moveable contacts M1-M5 on the contact points S1-S5 formed as groups of 2 arranged in a continuous line, the contact position or contact event can be detected. Figure 36(a) is constructed of a film shaped moveable part 27 with protrusions 24 on the top and a conductor 58 on the bottom, and a substrate 23 with spacers 21 and contact points S. With the pressure of a finger, the film shaped moveable part 27 short-circuits the curved contact point S. Thus the point of contact is detected via the electrical current position and time. (b) shows an overhead view of this input device. By using the aforementioned touch input detection method on this input device it is possible to improve the input operability. Next, in the embodiment example for this invention, there is a touch input detection method that has a display means and a cursor to display which of multiple items are currently selected, and is equipped with moveable contacts in varying densities along a line or arc, with contact points on the bottom, with spacers so the moveable contacts and contact points do not usually touch, with protrusions on the top surface of the moveable contact part so that the cursor can be synchronized with the number of events generated by pressing continuously on the two adjoining moveable contacts, and that can be shifted or fast-forwarded. As shown in Figure 37, there is a substrate 59 on a hard plate K made of metal. There are sets of two contact points 60 on the substrate, followed by spacers 54 and then protrusions 57 on the top surface. There are moveable contacts made of conductors below the film shaped sheet. As shown in (a), a touch event is generated by pressure from the top or bottom via a finger and this finger can control the input items by sliding. Figure 37(b) is an overhead view of the touch detection input device along a line with varying densities. In this case, the distance and number of input events is not proportional. The number of input events varies by touch position. It is possible to improve the input operability using the touch input detection method for this input device. These are illustrative examples to describe this invention but the user should understand if there are any omissions in the spirit or scope of this invention. The aforementioned embodiment examples are simply for illustration purposes and should not be interpreted as limitations on the scope of this patent.

[0036]

[Effect of this Invention] As indicated above, the aforementioned means on the touch detection means or the contact operation type input device has multiple items, data and functions that are housed on an electronic mechanism. It is possible to have a large number of functions and to select data. The many functions can be easily employed to improve operability. The device containing the aforementioned means can be made of thin parts without adversely impacting the convenience between left and right-handedness and improves operability for both. When using the aforementioned means

equipped with a touch detection switch, and input is conducted according to the number of sensor touch events, the finger can sense the number of events input and thus can freely control them. By altering the number of events per location, the operability and multi-functionality can be improved. By installing keys on the touch detector, the aforementioned means with a touch input part can reduce the number of parts as well as

improve the operating functions. Finally, the device in this invention involves a thin electronic mechanism such as an IC card so it is possible to create a rotating operation type input configuration.

[Brief Description of the Figures]

[Figure 1] This is a circuit diagram of the electrostatic induction detection system for the embodiment of this invention.

[Figure 2] This is a circuit diagram of the optical detection system for the embodiment of this invention.

[Figure 3] This is a diagram of the arrangement of the luminous element and the light receiving element of the optical detection means for the embodiment of this invention, (a) is a cross-section and (b) is an overhead view.

[Figure 4] This is another diagram of the arrangement of the luminous element and the light receiving element of the optical detection means for the embodiment of this invention.

[Figure 5] This is a circuit diagram of the direct current resistance detection system for the embodiment of this invention.

[Figure 6] This is a conceptual diagram of the resistant film detection system for the embodiment of this invention, (a) is a diagram of the resistant film arrangement and (b) illustrates the voltage distribution.

[Figure 7] This is a circuit diagram showing the same resistant film detection system.

[Figure 8] This shows the moving electrode detection means for the embodiment of this invention, (a) is a cross-section and (b) is a circuit diagram.

[Figure 9] This is a diagram of the arrangement of the touch detection sensors for the embodiment of this invention, (a) shows a linear arrangement parallel to a switching means, (b) shows an arc shaped arrangement adjacent to a switching means, (c) shows a linear perpendicular arrangement, (d) shows a multiple parallel arrangement and varying detection densities.

[Figure 10] This is a diagram showing an example of the contact type electronic parts on the horizontal slide type push switch for the embodiment of this invention.

[Figure 11] This is a side view of another example of the contact type electronic parts on same push switch.

[Figure 12] This is a cross-section and summary diagram of the round contact type electronic parts of the push switch for the embodiment of this invention, (a) is the integrated sensor and switch, (b) is the separate sensor and switch.

[Figure 13] This is another example of the contact type electronic parts on push switch for the embodiment of this invention.

[Figure 14] This is another example of the contact type electronic parts on same push switch.
[Figure 15] This is a summary diagram of the arrangement of touch detection sensors for the embodiment of this invention. In reality, if it is close to an analog type, the length is uneven if there are no event generation points.
[Figure 16] This is a side view of the key switch on the touch detector of the key tip for the embodiment of this invention. (a) is one with a sensor on the top of a key, (b) is one with multiple sensors, (c) and (d) are those with touch detectors or touch pads.
[Figure 17] This is an electronic mechanism on a touch detection input device for the embodiment of this invention. (a), (b), (c) are front views, (d), (e), (f) are side views.
[Figure 18] This is an electronic mechanism on a touch detection input device for the embodiment of this invention. (a) is a front view of the round track shape, (b) is a side view of the side, (c), (d), (e) are front views of the card style or cube, (c) is an arrangement with uneven distribution of the tracks on a line, (d) is one with a multiple parallel arrangement, (e) is one with a circular arrangement.
[Figure 19] This is a front view of one with a track arrangement of the key switches on the touch detector on the top of a key for the embodiment of this invention. (a) shows a linear arrangement, (b) shows a cross or spokes, (c) shows a parallel arrangement, (d) shows a parallel or cross or a spoke arrangement.
[Figure 20] This is a block diagram showing the circuitry of the touch detection input device for the embodiment of this invention.
[Figure 21] This is a front view of the remote control with an infrared LED on the touch detection input device for the embodiment of this invention. For the function list or the data list display, the data pointer or cursor is pressed and the list is shown at the right.
[Figure 22] This is a diagram of the remote control operation with an infrared LED on the touch detection input device for the embodiment of this invention.
[Figure 23] This is a diagram of the remote control operation with an infrared LED on the touch detection input device for the embodiment of this invention.
[Figure 24] This is a diagram of the remote control operation with an infrared LED on the touch detection input device for the embodiment of this invention.
[Figure 25] This is a diagram of the remote control operation with an infrared LED on the touch detection input device for the embodiment of this invention.
[Figure 26] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.

[Figure 27] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.
[Figure 28] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.

[Figure 29] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.
[Figure 30] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.
[Figure 31] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.
[Figure 32] This is a diagram of the remote control operation with an infrared LED on the round touch detection input device for the embodiment of this invention.
[Figure 33] This is a diagram of the remote control operation with an key switch on the touch detection input device on the top of a key for the embodiment of this invention.
[Figure 34] This is a diagram explaining the data pointer movement during touch input detection for the embodiment of this invention.
[Figure 35] This is a block diagram showing the touch input detector circuit for the embodiment of this invention.
[Figure 36] This is a diagram illustrating the touch input detector for the embodiment of this invention.
[Figure 37] This is a diagram illustrating the touch input detector for the embodiment of this invention.

[Description of Symbols]
1...Pulse generation circuit
2...Scan drive circuit
3...CR phase oscillator
4...frequency comparison circuit
5...control circuit
6...decision circuit
7...luminous element
8...light receiving element
9...demultiplexer
10...multiplexer
11...decision circuit
12...control circuit
13...AD converter
14...metal contact point switch
15...resistant film
16...electrode
17...voltage measuring device
18...control circuit
19...counter

20...decoder
21...spacer
22...movable electrode
23...stationary electrode
24...touch position detection sensor 43
25...pressure switch or touch switch
26...flexible contact skid
27...push switch
28...protrusion
29...contact installation plate
30...terminal
31...terminal
32...keypad holder
33...spring board
34...touch position detector
35...cable
36...holder
37...touch sensor
38...connector
39...switch
40...round track shaped touch position detection sensor
41...touch sensor key on keypad
42...multiple sensor keys on keypad
43...touch pad
44...liquid crystal display
45...display
46...speaker
47...audio circuit
48...operation control circuit
49...touch detection circuit
50...application system
51...luminophor
52...cursor
53...LED
54...spacer
55...conductive pattern
56...film moving element
57...protrusion
58...conductor
59...substrate
60...stationary electrode

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Figure 1
Figure 2
Figure 3
Figure 4
Figure 21
Function
Data pointer cursor

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Figure 5
High resistance detection terminal switch module metal contact point switch
Figure 6
Figure 10

Figure 7
Figure 8
Figure 22
Function
Data pointer cursor

Figure 23
Function
Data pointer cursor

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Figure 9
Figure 11
Figure 12
Figure 13
elastic body
sensor
switch
contact
case
substrate
cable socket
cable
switch
sensor
case

Figure 14
Touch operation
screw

Figure 15

(a)	sparse	dense
(b)	sparse	dense
(c)	sparse	dense
(d)	dense	sparse

Figure 17
Figure 18

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Figure 16
Figure 19
Figure 24
    Function
    Data pointer   cursor
Figure 25
    Function
    Data pointer   cursor

Figure 20

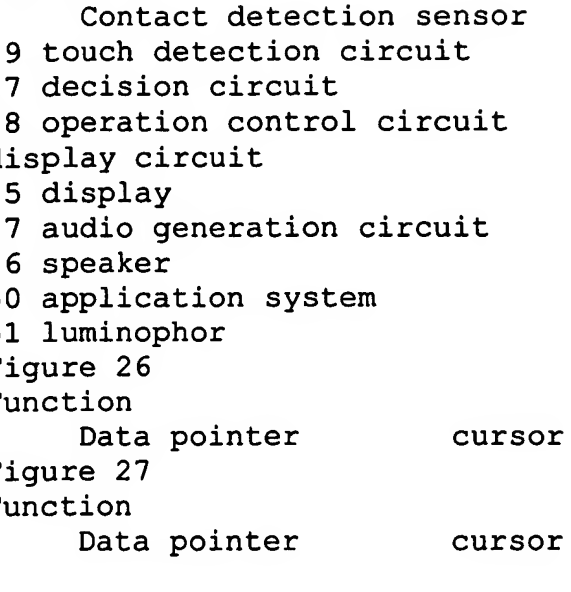

Figure 26

Figure 27

Figure 28
Function
Data pointer cursor
Figure 29
Function
Data pointer cursor
Figure 30
Function
Data pointer cursor
Figure 31
Function
Data pointer cursor
Figure 32
Function
Data pointer cursor
Figure 34
Touch sensor
(b) data table
pointer
3rd pointer
1st pointer
2nd pointer

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Figure 33
Figure 35

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Figure 36
Figure 37